Embedding Ethics in European Information & Communication Technology Curricula

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Abstract
In this paper, we present approaches to teaching ICT ethics in various settings in several European countries. The picture which emerges from the cases we present, and the context thereof, is a challenging one. For while it is possible to come up with examples of good practice, a systematic approach to the need for ICT ethics education is currently lacking thoughout most of Europe. Hence, we can conclude our paper with a handful of recommendations for action in this area by the members of the ICT ethics research (and teaching) community.

1 Introduction
In most industrialised countries, including Europe, Information Communication Technology (ICT) competences are a prerequisite for the majority of jobs, and even for life as a fully functioning member of society in general. In recognising this, universities, colleges, high schools, careers developers, train-the-trainers organizations, etc. have introduced ICT courses and programmes. But ICT also introduces many, often quite new, ethical dilemmas for its developers and users (both professional and otherwise). Whilst ICT ethics as part of the professional curriculum is well covered in some countries (see section 2.1) the situation in Europe presents a diverse picture. In presenting curricula and methods for teaching ICT ethics at different levels in this paper, we aim to begin a process of ICT ethics education that can be more coherent.

We do this by focussing successively on various contexts for ICT education in our home institutions and countries (Belgium, Italy, the United Kingdom (UK)). First, in section 2, we address education of ICT professionals, ranging from professional bachelor to engineering PhD students. Next, we venture outside the realm of higher education, and look at the secondary school context. As we shall note, this raises important issues about teacher training, and we therefore turn to that context in section 4. We end with a short conclusion and some proposals for further research as well as a call for action at the educational policy level.

2 Ethics and ICT at professional level in universities and colleges

In this section, we address the education of future ICT professionals at various levels in colleges and universities. Many curriculum outlines for such study programmes prescribe a significant amount of attention to ethical and social issues of ICT. Indeed, in the US and the UK, most ICT study programmes do comprise one or more ICT ethics courses. This is not the case, however, in most mainland European countries. And even when there is an ICT ethics course on the programme, it is often a real challenge to be of sufficient interest to "technical" students for the course to be effective in a significant way.

Below, we first briefly look at the position of ICT ethics in higher education. Subsequently, we describe in some detail the educational approach in an ICT ethics course offered to engineering PhD students in an Italian university. Then we offer some comments on a Flemish course offered to professional bachelor students. Finally, we conclude this section with a look at the situation in British higher education institutions.

2.1 ICT ethics and society in higher education ICT curriculum outlines

This is not a new subject for lecturers in higher education. The topic of computer ethics has been presented in text books since at least 1985 (see e.g. [Johnson, 1985]; [Johnson and Snapper, 1985]) and regularly updated as technology progresses (see e.g. [Tavani, 1996]). It is probably fair to say that the United States took the lead in introducing the topic of ethics to the engineering community and to the education of professionals, and formalised this by providing a curriculum based on knowledge units [ImpactCS project, and Martin, 1997]. Others have followed, for example the Core Body of Knowledge approved by the Australian Computer Society in 1997 included ethics and social implications in its recommendations [Underwood, 1997], and a review in 2008 maintains ethics as 'professional knowledge' [Gregor et al., 2008]. The British Computer Society (BCS) has also required ethics to be included in degree programmes for the purposes of BCS accreditation [British Computer Society, 2007].

The above gives something of a snapshot of the place of ethics in ICT professional education, but it is beyond the scope and space limitation of this paper to undertake a full review of the initiatives internationally in teaching ICT ethics. In this paper we focus on the case of Europe, which is interesting in that it is constituted by a group of countries with diverse cultures and at different stages of economic development but which is advised in policy terms by a Parliament (European Parliament), setting broad Directives that are binding to the Member States (e.g. on privacy). The different approaches to the teaching, and perceived importance, of ICT ethics in the three countries discussed in this paper indicate a lack of coherence in Europe regarding the education of ICT professionals (and users) as far as ethics and ICT is concerned.

2.2 An example of an approach in an academic context at the Politecnico di Torino

Whether at academic or professional level, introducing ethical issues of ICT in higher education ICT curricula often constitutes a real challenge. Teachers are faced with students who have followed years of courses, all of them concentrated only on the technical side. A suggestion for introducing ethics in these situations is to start from real case analysis with a bottom-up approach.

One example of a fruitful methodology was tested "in-field" at the Politecnico di Torino in Italy for teaching computer ethics to PhD students in engineering (computer science, etc.). It is composed of four steps: describe a real controversial case, identify all stakeholders and their interconnections ("stakeholders network"), identify the ethical issues that arise from the

case and finally, define possible alternative scenario(s) for dealing with them. The students' reaction to this approach is usually quite positive since they start from a familiar, technical context (e.g. a "national DNA database") and then, with the support of the teacher, they "climb" the path towards non-technical issues like the social and ethical consequences of such projects.

From the very first step, the engineering students start a so-called "reflexivity" process: the complete description of the real case introduces them to the complexity of the reality and to the out-of-the-box way of thinking in order to capture the entire scenario, not just the "technical problem" they are asked to solve. If ICT professionals are involved in a project, for example, implying the construction of a gigantic DNA database for security purposes, then they have to consider the social context of this project, not just the technicalities. Who is the sponsor of the project? Where does the budget come from? Why is there a wish of having a database of citizens´ DNA? What is the role of end-users and citizens in general? What kind of society are we going to shape with this project? This introduces the fundamental concept of Science, Technology and Society studies where technology and society co-shape each other [Johnson, 1985].

In the second step, students trace the "stakeholders network": all parties involved in some way in the project are identified and the relationships among them are described as well. Continuing with our "national DNA database" example, this can result in a network as shown in Fig. 1.

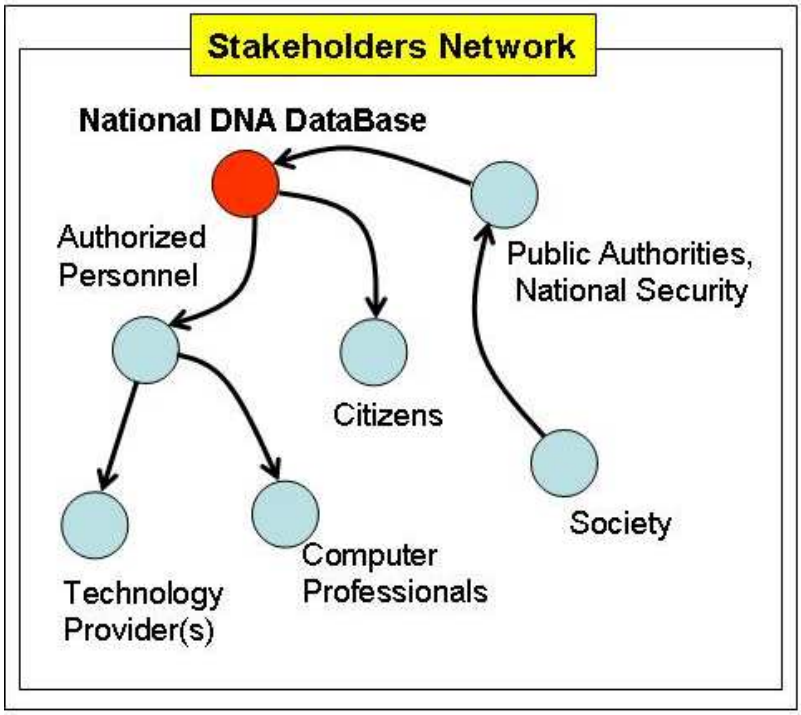

Fig.1

In this case, a very simple version of the stakeholders network (that indeed could be much more complex) features:

- the public authorities (national security), the main sponsor;
- this relates to the entire society, of course;
- the citizens, the main "target" of this kind of systems;
- the authorized personnel that will use the system;

- this is connected with technology providers and computer professionals involved in the development of the system and the personnel that will be the end-users of the system.

Here the "reflexivity" (the capacity of the actors, in this case PhD students in engineering, to recognize the forces that shape the scenario) [Bourdieu, 1992] starts. Usually, students capture the inter-connectedness of the relationships described in the stakeholder network. For example, computer professionals are of course involved in the design of the system, but clearly, they have also the key responsibility of designing the system with specific features. Values are always embedded into the system, and choices as to which values are prioritised are always made [see e.g. Nissenbaum, 1998; Duquenoy, 2007]. For example, the robustness of a system for regulating nuclear power plants is likely to be a higher priority that robustness of an office system used for producing letters or spreadsheets. Values such as human safety, dignity, privacy (as expressed in the Universal Declaration of Human Rights) are important in our society, and should be equally upheld in systems design.

In the third step, the students (supported by the teacher) try to identify all the ethical issues involved in the system by looking at the stakeholder network. In our example at least two, privacy and unreliability, are very easy to identify.

- *Privacy*
  Very sensitive personal data will be stored in the system. Those data could bring an insurance company to refuse a contract to a person with a DNA "marker" that carries information about "potential" diseases which the individual could develop in the future. This implies issues of informed consent by the users, the capability of accessing and correcting personal data, and strictly controlled access to data. A more fundamental ethical question is the following: is it true that by providing to security authorities such a system, our security will be improved to the extent that we are willing to sacrifice ("some") privacy.
- *Unreliability*
  Complex systems, like the one used in our example, will be never tested completely. In particular the software component will be so complex, the number of states to check will be so high, that at the end, engineers will be forced to release the software, even if they know very well that the system still contains some bugs. Furthermore, since the data stored in the system will also be of a complex nature, they too will be prone to unreliability. So here the ethical dilemma could be: taking into account the unreliability of the system, how can we ensure that the system will never enter a situation that could bring us to a catastrophic result? How can we avoid the "Titanic Effect" ("The severity with which a system fails is directly proportional to the intensity of the designer's belief that it cannot.") [Anonymous, 1985]?

In the fourth and last step of our methodology, where we try to define one or more possible alternative scenarios, a little theoretical background is treated. The main theories of ethics are introduced (deontologism, relativism, utilitarianism, etc.) and used for identifying possible scenarios: what could be changed in the system? This is of course the most challenging step in the process. It deals with questions such as what is right and what is wrong. Can we propose something different? Should we ask for the help of ethical reviewers [EU Commission, 2007]? Should we use the "Precautionary Principle" [Government of New Zealand, 2006]? Should we ask for a "moratorium" in some information technology research and/or applications development (such as implants, nanobots, etc.)? What should and/or can be the role of the (various) ICT professionals involved in the case?

It is very useful also to ask the students to think about a possible list of "recommendations" to, for example: project teams (e.g. when they are writing a research proposal and asking for

funding); universities (how to prepare the next generations of computer professionals, which is of course the very subject of this section of the paper); various organizations, professional and other (guidelines, "soft-laws", Codes of Ethics, etc.); public authorities ("hard-laws", advice to policy makers, etc.).

2.3 ICT ethics for professional bachelor students at Leuven University College

In the Dutch speaking part of Belgium (Flanders), Leuven University College is currently the only institute of higher education where a course on ICT ethics features on an ICT programme at the professional bachelor level. It is interesting to note that this course through focusing on specific cases in student projects, aims at discussion and debate. In so doing, it proves fruitful not only to get future ICT professionals thinking about the ethical aspects of their trade but also promotes several more general “soft skills” (arguing, presenting, debating, etc.). The course is an optional one, offered in the third (and final) year of the programme, and tends to be chosen by 20% to 25% of the students. So, there definitely is an audience for such courses among even the most “practically/technically oriented” of students. It must be noted however that this particular course is taught by a lecturer whose specialisation is in system management, network security and computer forensics. This probably contributes significantly to technical students taking an ethics course seriously, and voluntarily. (See [Johnson, 1994] for a much more extensive treatment of this issue, though from a slightly different perspective.)

2.4 ICT ethics for ICT bachelor students in the UK

The United Kingdom has a strong foundation for addressing ethics in ICT education. This is due mainly to the fact that the British Computer Society (BCS), the Chartered Institute for IT, requires ethics and professionalism to be addressed as part of course criteria for accreditation by the BCS. When universities are competing for students, accreditation of ICT programmes by the BCS adds value by providing a standard that meets qualification requirements for membership of this leading professional body. In doing this the BCS gives professional credence to the importance of ethics to ICT professionals (as is the case in other professions). The BCS do not dictate how this should be taught, but in validating courses for accreditation the assessors (a panel of usually 3 independent experts in ICT) need to see it is explicitly addressed, and assessed. This leaves universities open to different approaches; at what level, or levels (1st, 2nd or 3rd year undergraduates) it is taught, and whether the issues are covered in different modules (e.g. networks, security, databases etc.) or in a single module (e.g. ethical and professional issues). In addition, recent requirements by UK research councils for attention to ethics in funding applications and the consequent ‘trickle down’ to University research ethics committees has in some cases led to a requirement for ethics to be included in student projects (final year undergraduate and at masters level) and for research students – including computing science and engineering science departments.

As has been noted above, approaches to the curriculum vary. Ranging from professional dilemmas in ICT projects, in the workplace, and expected behaviour of ICT professionals to more of a focus on the ethical issues in the design, development and application of different technologies as they impact society. Lecturers who are assigned to teaching this subject are not usually trained for this speciality, and textbooks that give guidance are welcomed. Many of them are written from a United States perspective, but some others by UK authors [e.g. [Ayres, 1999]; [Adams & McCrindle, 2008]; [Duquenoy et. al., 2008]) or by authors from different nationalities in other languages than English (e.g. [Martens et al., 2008]. These textbooks typically cover key topics of computer ethics (privacy, intellectual property, computer crime, etc.) using case studies, examples, and questions for discussion and review. A popular method of teaching that fits well with the course content is to offer challenging

questions and real life examples for discussion by students, resulting in lively debates and exploration of both the issues and ethical approaches. Students at the beginning of a course often wonder what 'ethics' has to do with computing, but by the end of the course see how relevant it is.

3 Secondary (and primary) education

There has been a tendency in European schooling to focus on teaching pupils how to use IT for their school work, and of course as part of a wider educational approach aimed at improving 'digital literacy' and students' employment opportunities. The substantive issues of 'computer ethics' typical in for example, conferences such as ETHICOMP, are not generally addressed other than aspects of computer misuse, and the dangers posed to school children. These latter issues appear to be brought in under a category of 'eSafety' and serve to (a) educate children in the use (i.e. in combating mis-use) of mobile phones used as cameras, and the dangers of chatting online and (b) meet school policy and risk-reduction exercises. For example, the UK National Education Network states: "All schools have a responsibility to ensure that all pupils and staff access the internet safely and responsibly. Failure to do this could result in disciplinary or legal action taken against individuals, head teachers and governing bodies." [National Education Network, E-Safety Audit Tool]

The Rose Review (a report on the use of ICT in UK schools) published in 2009 promotes the use of ICT in schools, and encourages greater use at primary level: "Children use and apply their ICT knowledge, skills and understanding confidently and competently in their learning and in everyday contexts. They become independent and discerning users of technology, recognising opportunities and risks and using strategies to stay safe." [Rose Review, 2009]. Two points from an ICT curriculum newsletter [EPIC, 2009] reporting on the Rose Review are worth mentioning here:

- pupils use ICT effectively to communicate their ideas and to present their work, but they are less skilled in collecting and handling data and in controlling events using ICT;
- teachers tend to give more attention to those aspects of ICT where they themselves feel confident.

And there are strong indications that the situation in most other European countries is similar.

In 2006 and 2007 the Flemish government published ICT learning objectives for children of age 12 and 14 respectively. The safe and responsible use of ICT features prominently among them, but if you look at most teaching materials as well as current educational practice, they treat almost exclusively 'utilitarian' features. To remedy this, the Flemish Ministry of Education published a brochure [Flemish Government, 2007] with succint introductions to the main issues: reliability of online information, safe communication, dubious internet content, cyberbullying, intellectual property rights, health, and safety. The brochure includes a cd-rom with teaching materials (some specially developed, some adapted from Dutch materials, complemented with references to materials developed and sites maintained by third parties such as Child Focus and Safer Internet).

Some of the materials actually look quite useful and also the introductions to the various topics provided by the brochure are on average quite good. However, to the best of our knowledge, all this has had very little influence as yet on the teaching practice in schools. We conjecture there are several reasons for this:

- two years is rather short: from 2007 until 2009 there may not have been enough time to take these "new" elements into the classrooms;

- all the government attention is currently focussed on children between 8 and 14; probably, some of the topics should better and/or more thoroughly be addressed at a later age;
- a brochure may not be enough to make teachers feel confident with the subject matter, and they may therefore not be inclined to devote much attention to these issues, as is suggested by the above cited British study.

Whatever may be the reasons for the current state of affairs, it is not the lack of interest among pupils which should keep teachers from addressing ethical and social issues of ICT in the classroom. In a recent large scale study about ICT use and associated risk behaviour performed among Belgian teenagers, most Flemish subjects complained about the lack of attention in their ICT classes for topics such as reliability of online information, online privacy, virusses, spam, downloading, chatting, etc. [Bauwens et al., 2009]. (The Walloon educational curriculum for primary and secondary school currently does not feature ICT classes in any but a few programmes, so the Walloon pupils did not have similar complaints about the content of such classes.)

Personal experience gained from ICT ethics classes performed by students during their teaching practice points in the same direction. However, it is important to carefully select both the topics as well as the educational approach in such a way that they appeal to the pupils at hand [Martens, 2005 and 2007]. To illustrate this point, we briefly report on some classes by one of our students, Kurt Roosbeek, in November 2009. Roosbeek taught several groups of "high profile" (about) 15 year old pupils in a secondary school near Leuven, Belgium. In three subsequent weeks, he addressed the topics of cyberbullying, online privacy, and computer crime and ICT safety, devoting one class of about 50 minutes to each topic in three parallel groups. The following are some interesting observations about his experience in that context:
- almost all pupils showed substantial interest in all three topics;
- one group of pupils showed considerable disappointment when their third class, due to time constraints, had to be replaced by a (technical) class on database construction;
- many pupils actively engaged in very lively group discussions on the first and second topic; being more technical in nature, the third topic leant itself less to discussion;
- the class on e-privacy provoked by far the most intense interest; by starting each of those classes with a report of information found on the online profiles of pupils in that particular classgroup, the teacher almost immediately captured their undivided attention;
- many pupils changed the privacy settings on their online profiles after the class on online privacy.

For our purpose, it is interesting to further note that the appeal of both cyberbullying and computer crime and safety in these classgroups was on average somewhat less than that of online privacy. We conjecture that this is largely due to the particular age and profile of the pupils involved. On the one hand, in Flanders, as mostly elsewhere, the intensity of (cyber)bullying starts to decrease at the age of 15, and even more so in "high profile" classgroups [Vandebosch et al., 2004]. On the other hand, most of the pupils involved would still have been too young to have personal experience with e-banking, credit cards, etc. and nor will they personally have been responsible for most of the safety measures on the computers they use. Online privacy, however, turns out to be a very hot topic indeed among 15 year old pupils. At this age, many of them become "privacy conscious", virtually all of them sport online profiles on Facebook and/or elsewhere and vitually none of them have of their own accord investigated the privacy statement of the network site they use nor the

possibilities for privacy settings in their own profile. So, again, it is the teacher who must learn to judge what subject should best be treated when and in what way.

From the above, we conclude that both pupils and policy makers would like to see more classroom attention for social and ethical aspects of ICT. However, we also suspect that it is the teacher who must learn to judge what subject should best be treated when and in what way. So, the success of classes on ICT ethics and safety in secondary (and primary) school will largely depend on the competence of the teachers responsible for implementing them. This brings us to teacher training, the subject of our next section.

4 Teacher training

To meet the education needs identified above, ICT ethics must be treated in teacher training In the Leuven University College teacher training programme, a course on ICT ethics has been compulsory for (future) ICT teachers since 10 years [Martens, 2005 and 2007]. It was recently expanded and currently has a "size" of 4 ECTS credits, corresponding with an average intended student work load of 100 to 120 hours. The main goal of this course is twofold: enabling future ICT teachers to devise and teach (or lead) good classes on ICT ethics with pupils between 12 and 18, and making them want to do this. The latter is particularly necessary given the situation that such classes are currently by no means standard practice. So, how do we go about to achieve this?

The course´s educational approach is a mixture of various ingredients. There are seven seminar classes of 3,5 hours each. The first two of these are used for an introduction and broad overview of the field by the lecturer. The other five deal with privacy, copyright, computer crime, information on the internet, assorted issues related to the role of ICT in work, society and education, and how as well as when to deal with such issues in secondary school (ICT) classes. Throughout the course, a textbook dealing with these issues while focussing on local (Belgian and Dutch) cases serves as reference text [Martens et al., 2008]. All students are required to read the relevant chapters to prepare for participation in the classes. In this way, they get the necessary basic knowledge of the domain.
However, the whole area is subject to rapid change, and to be a good teacher, you must be able to pick up on developments, research a new issue, and illustrate important points with up-to-date examples and cases. These skills are to be acquired by the students through the execution of small research projects. Each of the five "topical" seminars is prepared by a student project group. Within their topic, they choose on what to focus and investigate the issues of their choice in much more detail than in the textbook. They of course look into relevant literature and online information, but are explicitly expected to also undertake less bookish "field" research. Recent examples of project preparation activities of the latter kind include interviews with supermarket managers on customer data processing, polls on illegal downloading by pupils and fellow students, assessment of the use of open source and creative commons materials in schools, investigation of the "digital divide" between the north and the south of Belgium through a (photographic) comparison of the ICT infrastructure in a Flemish and a Walloon teacher training college, and discussion of the ICT infrastructure development policy with ICT coordinators in schools. After all this preparation, the students themselves lead the whole of "their" seminar. They must not only present their findings, but aim at a high active participation of all participants through classroom hands-on research and experimentation, discussion and debate, quizzes, etcetera. In this way, the classes are also used as labs to test and improve teaching methods that can be used in their own future classes with secondary school pupils.

Finally, students are required to follow the news about current developments and cases in the field during the three months the course runs, preferably consulting general newspapers as well as ICT related magazines and online sources.

Students are evaluated in four different ways, each contributing more or less equally to their overall course result: preparation and execution of the research seminar they lead, active participation in classroom activity and online e-learning discussions during the course as a whole, content and reflective quality of the assembled materials on current developments and a concluding "examination" discussion with the lecturer to show their personal mastery of the whole problem domain as presented in the course textbook.
Taken together, all this provides the students with a good basis for ICT ethics classes in secondary school as well as (in most cases) with a considerable eagerness to try their hand at those during their teaching practice. When asked which improvements in the course content or teaching approach they wanted to propose for next year, the participants in the 2009 edition of the course unanimously replied none were needed…

In 2009, a similar course (of 3 ECTS credits) was for the first time offered as an option to teacher training students in other topics than ICT. It may be premature to draw conclusions after only one run, but we would like to share some preliminary observations. The course was chosen by about 10% of the students it was offered to, preparing to be a teacher in subjects as diverse as mathematics, physics, Latin, economics, technology, and physical education. In line with our findings in other contexts, almost all students arrive in the course virtually unaware of the issues it deals with. In fact, all of the 17 participants claimed to have chosen the course simply because it had "ICT" in its title, ignoring the fact that it also mentioned "ethics" and "society". In spite of this, upon completion of the course, almost all of them expressed their satisfaction with having taken it. The course aims at taking a more interdisciplinary approach to the field than does the one for ICT students described above, but apart from that both the content and the teaching approach are largely similar. It is therefore interesting to note that the degree of penetration of the field by the participants and the quality of the seminar preparation work was in most cases considerably less than is usual in the course for future ICT teachers. This may be partly due to the fact that the optional course has a smaller ECTS weight and is perceived by the participating students as "only" optional, and partly also to the fact that unlike the ICT students in the other course, most students apparently come to this course with no prior experience of well structured classroom discussions nor of research project work in groups. However, it also casts doubt on the wisdom of educational policy makers who claim that ICT use, including issues of safety and responsibility, can and should be learned by pupils exclusively through ICT use in classes on other subjects, guided by teachers who themselves have not specialised in ICT as a topic.

In this section, we have so far focussed on teacher training for (primary and) secondary education. In these contexts, ICT ethics will mainly be connected with education in ICT use by non professionals. However, as we argued in section 2, ICT ethics should and can also be incorporated in the education of future ICT professionals. In these study programmes, the stress is on the production (and/or administration) of ICT. We usually find some such programs in specialised study profiles at the secondary level, and furthermore of course at the higher level in colleges and universities. Most (other) courses in these programmes focus on technical aspects, and so usually prefer to do the pupils or students. Teaching such students "ethical reflexivity" can be a challenging task, which requires special preparation of the teachers in addition to the more general methods and considerations addressed above.

5 Conclusion

We have identified in our paper the need to introduce Ethics in European ICT Curricula but we should also find the right teachers for this challenging task. Our first recommendation is to start with a "train-the-trainer" phase. This first phase should provide teachers with the basic knowledge that will enable them to engage students who probably have never been exposed to ethical reflexivity related to the technical aspects of ICT.

One of the challenges with this subject is that the categorisations for teaching ethics in engineering sciences across Europe are diverse, ranging from a strong societal implication (e.g. "Science, Technology and Society") to very specific (e.g. "Social and Ethical Impact of Computing", "Computer Ethics", etc.). In some countries only the technical aspects of ICT are given to students, leaving the social and ethical aspects and impacts of ICT un-addressed. This field is naturally interdisciplinary requiring cross-fertilisation between engineers, social researchers, philosophers and others. Our second recommendation therefore is to instigate some interdisciplinary discussion to allow for the exchange of expertise, and encourage a shared understanding of the issues involved.

In this paper we have argued for the importance of “ICT ethics” in various ICT curricula. We have also looked at the current situation in various European educational contexts and found it to be less than optimal. We have presented in some detail example approaches in higher education of ICT professionals, secondary education and teacher training. In all of these settings, teaching ICT ethics is by no means obvious. Of crucial importance is the competence of the teachers, both with respect to domain expertise, as well as methodologically. This leaves the international research community on ICT ethics with a challenging but possibly very rewarding task, and leads to our third recommendation: systematically developing and evaluating ICT ethics teaching approaches and materials, and helping to put them into practice in ICT and ICT teacher training curricula.

Finally, although recommendations by professional bodies to include ethics in education curricula have a significant impact on the inclusion of ethics in ICT teaching and should be applauded, there is also the danger that such approaches become merely a ‘tick-box’ exercise and that the legitimacy, importance and value of this subject are not adequately recognised. It is important that the ‘people at the top’ in educational institutions understand that professional ethics in ICT has a crucial role to play. A ‘top-down’ lead sets the tone and will motivate teachers and students. As research efforts into teaching this subject across communities increase, and with the trend towards the inclusion of ethics in technical research and development programmes, as well as the raised public awareness of the impact of ICT and consequent need for the ICT industry to take on board the issues faced, we can hope that this message ‘filters-up’ to those ‘at the top’.

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